

OH in the Solar Spectrum

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(August 12, 1959)

Revised identifications of OH lines in the solar spectrum have been made from the detailed laboratory analyses of the $A^2\Sigma^+ - X^2\Pi$ bands. In the (0, 0), (1, 1), and (2, 2) bands a total of 175 solar lines are ascribed to OH unblended; 124 have OH as a partial contributor. Laboratory intensities along the branches of the separate bands have been used as a guide in making the solar identifications.

A new edition of solar spectrum wavelengths, identifications, and other relevant data, to replace the 1928 edition [1],¹ is in the course of preparation. This program includes the revision of molecular as well as atomic identifications of solar lines. Separate papers giving the solar identifications of individual selected molecules are being prepared. The first paper, *CH in the Solar Spectrum*, has been published [2]. The present paper is the second of this series.

In 1928, 185 solar lines were attributed wholly or partially to OH. The identifications were based on early laboratory measurements of the $\lambda 3064$ band by Grebe and Holtz [3], supplemented by Fowler's work [4]. Subsequently, Shaw [5] extended the identifications.

In 1948 Dieke and Crosswhite [6] published an extensive analysis of nine bands of the $A^2\Sigma^+ - X^2\Pi$ system of OH. They used an oxyacetylene flame as the light source, and photographed the spectrum from 2800 Å to 3550 Å in the second order of a 21-ft concave grating having 30,000 lines per inch, and set up in a Paschen mounting. For each line the intensity measurement is given. These measurements were carried out photographically. "The emulsion was calibrated with the help of iron lines of known intensity."

This splendid analysis has been used for the present work. A preliminary report on the revised identifications of OH lines in the solar spectrum was given by the authors in 1957 [7, 8]. Since then some revisions have been made and the counts have been done in more detail. The results are summarized in table 1.

From a study of the intensity measurements along the individual branches it appears doubtful whether lines having a laboratory intensity of about 10 or less are present in the sun. Most of the accessible lines in the last 6 bands listed in table 1 are faint.

High-dispersion solar spectra have the short-wave limit near 2950 Å because of the ozone absorption in the earth's atmosphere. Consequently, some of the OH bands cannot yet be examined in the solar spectrum over the entire range of laboratory observations. The (1, 0) and (2, 1) bands should be present, and may be detected when high-dispersion rocket spectra become available.

In tables 2, 3, and 4, the detailed analyses of the (0, 0), (1, 1), and (2, 2) bands, respectively, are given. These tables are arranged identically. Laboratory data are on the left, and solar data on the right. The rotational quantum numbers of the lines as assigned in the laboratory analyses are entered under the headings for the various branches, O, P, Q, R, and S. Primes denote satellite lines throughout. For example, in table 2, the line of wavelength 3066.114 Å, is a member of the R_{21} branch, and has the quantum number 5 entered in the R_1 column as 5'. Similarly, the line at 3090.270 Å has quantum number 4 in the Q_{12} branch, entered as 4' in the Q_2 column.

Dieke and Crosswhite have assigned individual intensities in cases where a line is blended. If the blending occurs within the same band, the intensities are entered in the table in the order of the rotational lines as read from left to right. For example in table 2, the line at 3091.186 Å is a blend. The intensity of the P_1 contributor is 416; that of the Q_{12} satellite line is 83. In cases where the blending occurs in different bands, an asterisk follows the laboratory wave number.

The solar entries are from the current revision. The wavelengths are from the 1928 edition with a small running correction applied to convert them to the 1928 International Solar Standards [9]. The intensities are the eye estimates as given in Rowland's table [10], with -3 substituted for Rowland's 0000; -2 for 000; and -1 for 00, as was done in 1928.

The differences in wavelength "sun—lab." indicate very good agreement between the measurements in the two sources. For example, in table 2, for the

¹ Figures in brackets indicate the literature references on page 280.

unblended lines the solar wavelengths average 0.007 Å greater than the laboratory measurements. In general, residuals greater than ± 0.030 Å are tolerated only if the solar line is a blend or is extremely faint.

In assigning solar identifications, judgment enters into the picture inherently. Some investigators are more conservative than others. Complications arise from blending, i.e., a solar line may have more than one contributor to its chemical origin. Many solar lines are produced by blends of atomic and molecular lines. The present assignments are based on the best available data among laboratory spectra. The symbol "||" preceding the chemical symbol, denotes a predominant contributor and "—" indicates a contributor stronger than the others. A dash, "—", in this column is used in the case of blends to distinguish the laboratory lines shorter than the solar wavelength from those that are longer. For example, in table 2, the laboratory wavelength of the Fe I line is less than the solar value 3078.044 Å, while that of the OH line is greater. In the case of the solar line at 3082.035 Å, OH is probably a contributor on the long-wave side of a solar line that is not yet completely accounted for as to chemical origin. If "OH" is entered in parentheses in this column, it is masked in the solar spectrum.

Under "Notes", the four letters have the following meaning:

P OH present in the solar spectrum, unblended.

B OH present in the solar spectrum, blended.

M OH masked in the solar spectrum.

A OH absent from the solar spectrum.

For laboratory lines of OH that are masked by stronger unresolved components, the "OH" entry in the solar identification column applies to the stronger OH line, and the weaker ones are masked. For example see table 4, λ3226.443.

In table 4, only 58 of the total of 159 lines have been compared with the solar ledger. Lines of intensity fainter than about 10 are probably absent, and coincidences between laboratory and solar wavelengths are considered accidental for the fainter lines.

We are deeply indebted to Mrs. Isabel D. Murray for the able assistance she has given in the preparation of these tables.

References

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- [8] C. E. Moore and H. P. Broida, Mém. soc. roy. sci. Liège [4]**18**, 252 (1957).
- [9] See Trans. Intern. Astron. Union **7**, 151 (1950).
- [10] H. A. Rowland, Astrophys. J. **1** to **5** (1895 to 1897).

TABLE 1. OH in the Solar Spectrum
Summary

| Table No. | Electronic transition | Vibrational transition | Wavelength range Å | Total number lines | Strongest solar int. Rowl. est. | Sun | | | | |
|-----------|---------------------------|------------------------|--------------------|--------------------|---------------------------------|-------------------|-------|--------|--------|-------|
| | | | | | | Summary of counts | | | | |
| | | | | | | Present | Blend | Masked | Absent | Total |
| 2 | A $^2\Sigma^+$ —X $^2\Pi$ | 0, 0 | 3021 to 3362 | 283 | 3 | 108 | 63 | 69 | 43 | 283 |
| 3 | | 1, 1 | 3109 to 3378 | 231 | 1 | 52 | 56 | 81 | 42 | 231 |
| 4 | | 2, 2 | 3184 to 3372 | 159 | —1 | 15 | 5 | 23 | 15 | 58 |
| | | | Total | 673 | | 175 | 124 | 173 | 100 | 572 |
| | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | 3, 3 | 3253 to 3356 | 73 | | | | | |
| | | | 1, 0 | 2811 to 3050 | 219 | | | | | |
| | | | 0, 1 | 3428 to 3545† | 119 | | | | | |
| | | | 2, 1 | 2854 to 3070 | 186 | | | | | |
| | | | 1, 2 | 3483 to 3545† | 56 | | | | | |
| | | | 3, 2 | 2944 to 3060 | 119 | | | | | |

† Wavelengths from one plate only; the authors state that the wave numbers should be increased by about 0.2 cm⁻¹ (see ref. 6).

TABLE 2. OH in the Solar Spectrum
 A $^2\Sigma^+$ —X $^2\Pi$ (0, 0)

| Laboratory | | | | | | | | Sun | | | | | | |
|----------------|-------------------------------|-------------------------------|----------------|----------------|----------------|------------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|-------|---|
| O ₂ | P ₁ P ₂ | Q ₁ Q ₂ | R ₁ | R ₂ | S ₁ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖—lab. Å | Solar identification | Notes | |
| | | | | | 15, 16 | 2+2+2 | 33088. 89* | 3021. 285 | | | | | A | |
| | | | | | 14, 17 | 3+1 | 33083. 82 | 3021. 749 | 3021. 719 | 0 | -0. 030 | | M | |
| | | | | | 13 | 4 | 33073. 92 | 3022. 652 | | | | | A | |
| | | | | | 18 | 1 | 33073. 07 | 3022. 730 | 3022. 747 | 3 | +0. 017 | Mn I | M | |
| | | | | | 12 | 5 | 33059. 25 | 3023. 994 | | | | | A | |
| | | | | | 11 | 7 | 33039. 96 | 3025. 760 | | | | | A | |
| | | | | | 10 | 9 | 33016. 31 | 3027. 927 | 3027. 890 | -1N | -0. 037 | -Pd I | M | |
| | | | | | 9 | 11 | 32988. 40 | 3030. 490 | 3030. 484 | -3 | -0. 006 | OH? | P | |
| | | | | | 8 | 14 | 32956. 39 | 3033. 433 | 3033. 434 | 4d? | +0. 001 | V II | M | |
| | | | | | 7 | 18 | 32920. 61 | 3036. 730 | 3036. 754 | 2N | +0. 024 | -Ti II | M | |
| | | | | | 6 | 22+3 | 32881. 22* | 3040. 368 | 3040. 35 | -3 | -0. 02 | OH | P | |
| | | | | | 5 | 26 | 32838. 48 | 3044. 325 | 3044. 333 | -2 | +0. 008 | OH | P | |
| | | | | | 4 | 29 | 32792. 81 | 3048. 565 | 3048. 569 | -3 | +0. 004 | OH | P | |
| | | | | | 3 | 30 | 32744. 63 | 3053. 051 | 3053. 068 | 3 | +0. 017 | Fe I | M | |
| | | | | | 2 | 28 | 32694. 55 | 3057. 727 | | | | | A | |
| | | | | | 1 | 19 | 32643. 36 | 3062. 523 | 3062. 52 | -1 | 0. 00 | OH? | P | |
| | | | | | 402 | | 32632. 25 | 3063. 565 | 3063. 555 | 3 | -0. 010 | OH | P | |
| | | | | | 8, 10, 9' | 415+378+44 | 32630. 55 | 3063. 725 | 3063. 729 | 2 | +0. 004 | OH | P | |
| | | | | | 8' | 55 | 32628. 46 | 3063. 921 | | { | +0. 015 | Ni II— Fe I | M | |
| | | | | | 10' | 31 | 32627. 94 | 3063. 970 | 3063. 936 | 2 | -0. 034 | | M | |
| | | | | | 7 | 415 | 32625. 61 | 3064. 189 | 3064. 216 | 2 | { | OH—OH | B | |
| | | | | | 11 | 346 | 32625. 11 | 3064. 236 | | { | -0. 020 | | B | |
| | | | | | 7' | 68 | 32623. 68 | 3064. 370 | 3064. 377 | 1 | +0. 007 | Co I | M | |
| | | | | | 11' | 27 | 32622. 39 | 3064. 491 | 3064. 515 | -2 | +0. 024 | Nb II | M | |
| | | | | | 6 | 397 | 32617. 51 | 3064. 950 | 3064. 955 | 1 | +0. 005 | OH | P | |
| | | | | | 12, 6' | 310+83 | 32615. 97 | 3065. 095 | 3065. 094 | 2 | -0. 001 | OH Cr I | B | |
| | | | | | 12' | 20 | 32613. 02 | 3065. 372 | | | | | A | |
| | | | | | 5 | 363 | 32606. 60 | 3065. 976 | 3065. 994 | 2 | +0. 018 | OH—Mn I | B | |
| | | | | | 5' | 100 | 32605. 13 | 3066. 114 | 3066. 144 | 0 | +0. 030 | OH—Al I | B | |
| | | | | | 13 | 271 | 32602. 96 | 3066. 318 | 3066. 364 | 1 | +0. 046 | Ti II V I | M | |
| | | | | | 13' | 15 | 32599. 82 | 3066. 613 | | | | | A | |
| | | | | | 4 | 304 | 32593. 16 | 3067. 240 | 3067. 262 | 8 | +0. 022 | Fe I | M | |
| | | | | | 4' | 114 | 32591. 92 | 3067. 356 | 3067. 386 | 1N | +0. 030 | OH— | B | |
| | | | | | 10 | 352 | 32588. 68 | 3067. 661 | 3067. 657 | 1 | -0. 004 | OH | P | |
| | | | | | 9 | 373 | 32587. 47 | 3067. 775 | 3067. 781 | 1 | +0. 006 | OH | P | |
| | | | | | 14 | 11 | 230+323 | 32585. 84 | 3067. 929 | 2 | +0. 010 | OH—Fe I | B | |
| | | | | | 14' | 8 | 11+383 | 32582. 14 | 3068. 277 | 1 | +0. 004 | OH | P | |
| | | | | | | 12 | 290 | 32578. 63 | 3068. 608 | 3068. 598 | 1 | -0. 010 | OH | P |
| | | | | | 3 | 234 | 32577. 61 | 3068. 704 | 3068. 725 | 1 | +0. 021 | OH—Fe II | B | |
| | | | | | 3' | 126 | 32576. 60 | 3068. 799 | 3068. 796 | 0 | -0. 003 | OH | P | |
| | | | | | 7 | 378 | 32572. 59 | 3069. 177 | 3069. 181 | 2 | +0. 004 | OH | P | |
| | | | | | 13 | 255 | 32567. 30 | 3069. 675 | 3069. 681 | 1 | +0. 006 | OH VI | B | |
| | | | | | 15 | 193 | 32564. 78 | 3069. 913 | 3069. 915 | 1 | +0. 002 | OH | P | |
| | | | | | 15' | 9 | 32561. 27 | 3070. 244 | | { | +0. 021 | Mn I | M | |
| | | | | | 2 | 152 | 32560. 48 | 3070. 318 | 3070. 265 | 3 | { -0. 053 | | M | |

TABLE 2. OH in the Solar Spectrum
 A $^2\Sigma^+$ —X $^2\Pi$ (0, 0)—Continued

| Laboratory | | | | | | | | Sun | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|-------|
| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | S ₁ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖-lab. Å | Solar identification | Notes |
| | | | | | 2' | 6 | | 127 | 32559.53 | 3070.392 | 3070.380 | -1 | -0.012 | OH | P |
| | | | | | | 14 | | 359 | 32558.79 | 3070.478 | 3070.492 | 1 | +0.014 | OH | P |
| | | | | | | | | 218 | 32551.72 | 3071.145 | 3071.145 | 1 | 0.000 | OH—Fe II | B |
| | | | | | | 1 | | 69 | 32542.56 | 3072.009 | 3071.965 | 1 | -0.044 | Co I | M |
| | | | | | | 1' | | 102 | 32541.99 | 3072.063 | 3072.115 | 3 | +0.052 | Ti II | M |
| | | | | | | | | 325 | 32540.55 | 3072.199 | 3072.182 | 0 | -0.017 | OH | P |
| | | | | | | 16 | | 159 | 32539.38 | 3072.308 | 3072.328 | 3 | +0.020 | OH—[Co I | B |
| | | | | | | 16' | | 6 | 32535.67 | 3072.660 | 3072.670 | -2 | +0.010 | OH? | P |
| | | | | | | | | 183 | 32531.76 | 3073.028 | 3072.984 | 6Nd? | -0.044 | Ti II | M |
| | | | | | | | | 273 | 32517.58 | 3074.369 | 3074.385 | 1 | +0.016 | OH | P |
| | | | | | | 17 | | 131 | 32509.61 | 3075.123 | 3075.135 | 0 | +0.012 | OH | P |
| | | | | | | | | 151 | 32507.38 | 3075.334 | 3075.355 | 0 | +0.021 | OH | P |
| | | | | | | 17' | | 5 | 32505.77 | 3075.486 | | | | A | |
| | | | | | | | | 204 | 32489.49 | 3077.028 | 3077.027 | 0 | -0.001 | OH | P |
| | | | | | | | | 125 | 32478.48 | 3078.071 | 3078.044 | 4d? | -0.027 | [Fe I—OH | B |
| | | | | | | 18 | | 102 | 32475.28 | 3078.373 | 3078.387 | 2 | +0.014 | OH | P |
| | | | | | | | | 239 | 32474.58 | 3078.440 | 3078.445 | 3 | +0.005 | OH Fe I | B |
| | | | | | | 1 | | 166 | 32474.28 | 3078.468 | | { | -0.023 | | M |
| | | | | | | 18' | | 3 | 32471.28 | 3078.753 | 3078.662 | 8d? | -0.091 | Ti II Fe II | M |
| | | | | | | | | 437 | 32458.65 | 3079.951 | 3079.979 | 4 | +0.028 | OH—Fe I | B |
| | | | | | | 2 | | 152 | 32458.07 | 3080.006 | | { | -0.027 | | M |
| | | | | | | 18 | | 138 | 32455.70 | 3080.231 | 3080.245 | 0 | +0.014 | OH | P |
| | | | | | | | | 98 | 32444.91 | 3081.255 | 3081.247 | 2 | -0.008 | OH Fe I | B |
| | | | | | | 3 | | 616 | 32441.90 | 3081.541 | 3081.550 | 1 | +0.009 | OH | P |
| | | | | | | 3' | | 130 | 32441.07 | 3081.620 | | | | A | |
| | | | | | | | | 252 | 32440.60 | 3081.665 | 3081.680 | 1 | +0.015 | OH | P |
| | | | | | | 1 | | 80 | 32436.38 | 3082.065 | 3082.035 | 1 | -0.030 | -OH | B |
| | | | | | | 19' | | 2 | 32432.27 | 3082.456 | | | | A | |
| | | | | | | 4 | | 766 | 32423.63 | 3083.278 | 3083.282 | 1 | +0.004 | OH | P |
| | | | | | | 4' | | 111 | 32422.62 | 3083.374 | 3083.382 | -1 | +0.008 | OH | P |
| | | | | | | | | 68 | 32415.51 | 3084.050 | 3084.055 | -1 | +0.005 | OH | P |
| | | | | | | 5 | | 77 | 32406.64 | 3084.894 | 3084.897 | 1 | +0.003 | OH | P |
| | | | | | | 5' | | 884 | 32403.47 | 3085.196 | 3085.206 | 2 | +0.010 | OH | P |
| | | | | | | | | 93 | 32402.10 | 3085.317 | 3085.331 | 1 | +0.014 | Cr II | M |
| | | | | | | 20 | | 66 | 32392.66 | 3086.226 | 3086.229 | 0 | +0.003 | OH | P |
| | | | | | | | | 335 | 32390.94 | 3086.390 | 3086.400 | 1 | +0.010 | Co I—OH | B |
| | | | | | | 20' | | 2 | 32388.38 | 3086.634 | 3086.636 | -1 | +0.002 | | M |
| | | | | | | 6 | | 974 | 32380.99 | 3087.338 | 3087.345 | 1 | +0.007 | OH | P |
| | | | | | | 6' | | 77 | 32379.49 | 3087.481 | 3087.453 | 0 | -0.028 | Fe I—OH | B |
| | | | | | | | | 59 | 32363.49 | 3089.008 | 3089.000 | 0 | -0.008 | OH | P |
| | | | | | | 7 | | 995 | 32355.88 | 3089.734 | 3089.745 | 2 | +0.011 | OH | P |
| | | | | | | 7' | | 62+293+439 | 32354.55 | 3089.861 | 3089.868 | 2 | +0.007 | OH | P |
| | | | | | | 2,3 | | +95+100 | | | | | | | |
| | | | | | | 2',3' | | 94 | 32350.27 | 3090.270 | 3090.222 | 1N | -0.048 | Fe I—Co I | M |
| | | | | | | 4' | | 589 | 32349.29 | 3090.364 | 3090.374 | 1 | +0.010 | OH | P |

| | | | | | | | | | |
|---|-------|-----|---------|-----------|-----------|-----------|------|---|-------------------------------------|
| 3 | 1' | 21 | 70 | 32348. 40 | 3090. 449 | 3090. 486 | 0 | { +0. 037 +0. 013 +0. 006 +0. 027 +0. 010 | { OH OH CH OH OH |
| | 1 | | 139 | 32348. 15 | 3090. 473 | | | | |
| 3 | 5' | | 47 | 32344. 08 | 3090. 862 | | | | |
| | 5 | | 416+83 | 32340. 69 | 3091. 186 | | | | |
| | 5 | | 712 | 32338. 86 | 3091. 361 | | | | |
| 3 | 8 | 21 | 1000 | 32328. 06 | 3092. 394 | 3092. 403 | 1 | +0. 009 | OH |
| | 8' | | 50 | 32326. 15 | 3092. 577 | 3092. 598 | -3 | +0. 021 | CH OH |
| | 6' | | 71 | 32325. 38 | 3092. 650 | 3092. 712 | 4 | +0. 062 | Al I |
| | 6 | | 808 | 32323. 96 | 3092. 786 | 3092. 851 | 1 | +0. 065 | Al I (OH) |
| | | | 45 | 32315. 37 | 3093. 609 | 3093. 608 | -1 | -0. 001 | OH |
| 3 | 1' | 21 | 143 | 32314. 19 | 3093. 722 | 3093. 723 | -2 | +0. 001 | OH |
| | 7' | | 58 | 32306. 49 | 3094. 459 | 3094. 469 | -1 | +0. 010 | OH |
| | 7 | | 855 | 32304. 83 | 3094. 618 | 3094. 626 | 2 | +0. 008 | OH |
| | 9 | | 973 | 32297. 38 | 3095. 342 | 3095. 347 | 3 | +0. 005 | OH |
| | 9' | | 40 | 32295. 15 | 3095. 546 | 3095. 554 | -1N | +0. 008 | OH |
| 4 | 2, 2' | 22 | 35 | 32290. 40 | 3096. 000 | 3096. 138 | 2 | +0. 014 -0. 025 -0. 026 +0. 072 | OH Cr II Fe II—OH —OH Mg I |
| | | | 492 | 32289. 12 | 3096. 124 | | | | |
| | | | 114+154 | 32286. 76 | 3096. 349 | | | | |
| | 8' | | 48 | 32283. 62 | 3096. 650 | | | | |
| | 8 | | 873 | 32281. 74 | 3096. 830 | | | | |
| 4 | 10 | 22 | 912 | 32263. 45 | 3098. 586 | 3098. 588 | 2 | +0. 002 | OH |
| | 10' | | 34 | 32262. 11 | 3098. 715 | 3098. 720 | -2 | +0. 005 | OH |
| | 9' | | 31 | 32261. 16 | 3098. 807 | 3098. 825 | -1 | +0. 018 | OH |
| | 9 | | 38 | 32256. 97 | 3099. 210 | 3099. 235 | 0 | +0. 025 | Zr II OH |
| | | | 860 | 32254. 86 | 3099. 411 | 3099. 418 | 1 | +0. 007 | OH |
| 2 | 3' | 23 | 158 | 32253. 54 | 3099. 538 | 3099. 575 | 0N | { +0. 037 -0. 018 +0. 013 | OH—OH OH |
| | 3 | | 33+215 | 32252. 97 | 3099. 593 | | | | |
| | | | 546 | 32235. 96 | 3101. 229 | | | | |
| | | | 26 | 32231. 51 | 3101. 657 | | | | |
| | 11 | 10' | 842+30 | 32226. 47 | 3102. 142 | | | | |
| 2 | 11' | 23 | 24+871 | 32224. 23 | 3102. 358 | 3102. 369 | 2 | +0. 011 | OH |
| | 4' | | 148 | 32214. 79 | 3103. 267 | 3103. 284 | 0 | +0. 017 | OH |
| | 4 | | 307 | 32214. 01 | 3103. 342 | 3103. 349 | 1 | +0. 007 | OH |
| | | | 25 | 32203. 57 | 3104. 348 | 3104. 349 | -1 | +0. 001 | OH |
| | 11' | | 23 | 32192. 44 | 3105. 421 | 3105. 464 | 2 | +0. 043 | Ni I |
| 3 | 11 | 23 | 763 | 32189. 94 | 3105. 663 | 3105. 677 | 1 | +0. 014 | OH |
| | 12 | | 43+752 | 32186. 27 | 3106. 017 | 3106. 032 | 2 | +0. 015 | OH |
| | 12' | | 18 | 32183. 55 | 3106. 279 | 3106. 241 | 3 | -0. 038 | Ti II |
| | | | 582 | 32180. 83 | 3106. 542 | 3106. 559 | 2 | +0. 017 | Fe II OH—Zr II |
| | 5' | | 131 | 32171. 36 | 3107. 457 | 3107. 459 | 0 | +0. 002 | OH—Ti I |
| 3 | 5 | 24 | 384 | 32170. 36 | 3107. 553 | 3107. 565 | 1 | +0. 012 | OH—Cr II |
| | | | 19 | 32167. 27 | 3107. 852 | 3107. 854 | -1 | +0. 002 | M |
| | | | 18 | 32154. 66 | 3109. 069 | 3109. 073 | 1 | +0. 004 | M |
| | 12' | | 690 | 32151. 97 | 3109. 330 | 3109. 333 | 3 | +0. 003 | Fe I—Hf II |
| | 12 | | 664 | 32142. 73 | 3110. 223 | 3110. 245 | 5Nd? | +0. 022 | OH—CH |
| 4 | 13' | 24 | 14+18 | 32139. 70 | 3110. 517 | 3110. 529 | -1 | +0. 012 | OH |
| | 6' | | 607+111 | 32123. 54 | 3112. 082 | 3112. 077 | 2 | -0. 005 | Ti II—[Fe I OH |
| | 6 | | 441 | 32122. 52 | 3112. 181 | 3112. 214 | 1N | +0. 033 | OH |
| 4 | 13' | 24 | 44+14 | 32113. 29 | 3113. 075 | 3113. 097 | -1 | +0. 022 | OH |
| | 13 | | 611 | 32110. 35 | 3113. 361 | 3113. 384 | 1 | +0. 023 | OH |

TABLE 2. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi (0, 0)$ —Continued

| Laboratory | | | | | | | | Sun | | | | | | | |
|------------|-------|-------|-------|-------|-------|-------|-------|-----------|---------------------------------|----------------------------|----------------------------|-------------------------|-------------------------------|----------------------|-------|
| O_2 | P_1 | P_2 | Q_1 | Q_2 | R_1 | R_2 | S_1 | Intensity | Wave number cm^{-1} | Wavelength \AA | Wavelength \AA | Disk int. Rowl. est. | \odot —lab. \AA | Solar identification | Notes |
| 284 | 7' | 7 | 14 | 14' | 25 | | | 14 | 32097. 35 | 3114. 622 | 3114. 628 | -1 | +0. 006 | | M |
| | | | | | | | | 569 | 32095. 83 | 3114. 769 | 3114. 778 | 1 | +0. 009 | OH | P |
| | | | | | | | | 11 | 32092. 65 | 3115. 077 | 3115. 043 | 1N | -0. 034 | Fe I | M |
| | | | | | | | | 94 | 32072. 36 | 3117. 048 | 3117. 037 | -1 | -0. 011 | OH | P |
| | | | | | | | | 481 | 32070. 89 | 3117. 191 | 3117. 201 | 1 | +0. 010 | OH | P |
| | 8 | 14' | 14 | 15 | 25 | | | 13 | 32070. 03 | 3117. 275 | 3117. 249 | 0 | -0. 026 | Cr II | M |
| | | | | | | | | 10 | 32068. 18 | 3117. 455 | 3117. 432 | -1N | -0. 023 | Ti I | M |
| | | | | | | | | 527 | 32065. 05 | 3117. 759 | 3117. 768 | 1 | +0. 009 | OH | P |
| | | | | | | | | 609 | 32063. 74 | 3117. 886 | 3117. 890 | 2 | +0. 004 | OH—Ti I | B |
| | | | | | | | | 478 | 32045. 43 | 3119. 668 | 3119. 678 | 1 | +0. 010 | OH CH—Cr I | B |
| | 5 | 15' | 15' | 15 | 26 | | | 8 | 32042. 10 | 3119. 992 | 3120. 012 | -1N | +0. 020 | OH—Fe II | B |
| | | | | | | | | 41 | 32036. 08 | 3120. 578 | 3120. 602 | -2 | +0. 024 | OH | P |
| | | | | | | | | 10+11 | 32021. 98* | 3121. 953 | 3121. 969 | -1 | +0. 016 | Cr II | M |
| | | | | | | | | 8+63 | 32019. 34* | 3122. 210 | 3122. 219 | 0 | +0. 009 | OH CH | M |
| | | | | | | | | 76 | 32017. 43 | 3122. 397 | | | | A | |
| | 8' | 8 | 15 | 15' | 26 | | | 447 | 32016. 08 | 3122. 528 | 3122. 570 | 2 | { +0. 042 } | OH OH—Cr II | B |
| | | | | | | | | 493 | 32015. 69 | 3122. 566 | | { +0. 004 } | OH | | |
| | | | | | | | | 531+48 | 32001. 56* | 3123. 945 | 3123. 959 | 1 | +0. 014 | OH? | P |
| | | | | | | | | 10 | 31994. 69 | 3124. 616 | 3124. 638 | -1 | +0. 022 | OH—OH | P |
| | | | | | | | | 399 | 31991. 48 | 3124. 929 | 3124. 918 | 2 | -0. 011 | CH OH | B |
| | 9' | 9 | 16 | 16' | 26 | | | 6 | 31988. 11 | 3125. 258 | 3125. 288 | 5 | +0. 030 | V II | M |
| | | | | | | | | 6+53 | 31966. 74* | 3127. 347 | 3127. 362 | 0 | +0. 015 | OH | M |
| | | | | | | | | 372 | 31963. 32 | 3127. 682 | 3127. 671 | 2d? | -0. 011 | OH CH | B |
| | | | | | | | | 61 | 31959. 14 | 3128. 091 | 3128. 086 | 0N | -0. 005 | OH—OH | B |
| | | | | | | | | 492+16 | 31957. 20* | 3128. 281 | 3128. 289 | 1 | +0. 008 | Sc II OH | B |
| | 6 | 10 | 16 | 16' | 27 | | | 36+48 | 31954. 81* | 3128. 515 | 3128. 521 | 0 | +0. 006 | OH | P |
| | | | | | | | | 7 | 31940. 34 | 3129. 933 | 3129. 947 | -1N | +0. 014 | Y II? | M |
| | | | | | | | | 548 | 31936. 84 | 3130. 276 | 3130. 267 | 3 | -0. 009 | V II—OH | B |
| | | | | | | | | 324 | 31933. 87 | 3130. 567 | 3130. 567 | 1 | 0. 000 | OH Fe II | B |
| | | | | | | | | 4 | 31930. 19 | 3130. 928 | | | | A | |
| | 10' | 10 | 17 | 17' | 27 | | | 7 | 31913. 37 | 3132. 578 | | | | A | |
| | | | | | | | | 4 | 31910. 47 | 3132. 863 | | | | A | |
| | | | | | | | | 305 | 31906. 78 | 3133. 225 | 3133. 216 | 1 | -0. 009 | OH | P |
| | | | | | | | | 49 | 31897. 55 | 3134. 132 | 3134. 116 | 8 | -0. 016 | Fe I Ni I | M |
| | | | | | | | | 475 | 31895. 44 | 3134. 339 | 3134. 337 | 1 | -0. 002 | OH Cr II | B |
| | 7 | 11 | 18 | 18' | 28 | | | 265 | 31872. 57 | 3136. 588 | 3136. 590 | 0 | +0. 002 | OH | P |
| | | | | | | | | 31+505 | 31869. 52 | 3136. 888 | 3136. 890 | 1 | +0. 002 | OH | P |
| | | | | | | | | 3 | 31868. 61 | 3136. 978 | | | | A | |
| | | | | | | | | 5 | 31852. 68 | 3138. 547 | 3138. 518 | 2 | -0. 029 | Fe I | M |
| | | | | | | | | 3 | 31850. 29 | 3138. 783 | 3138. 786 | 0 | +0. 003 | OH | M |
| | | | | | | | | 250 | 31846. 40 | 3139. 166 | 3139. 164 | 2 | -0. 002 | OH | P |

| | | | | | | | | | | | |
|----|-----|-----|-----|---------|------------|-----------|-----------|------|---------|----------------------|---|
| | | | | 38 | 31832. 84 | 3140. 503 | 3140. 511 | -2 | +0. 008 | OH | P |
| | 11' | 11 | | 445+9 | 31830. 53* | 3140. 731 | 3140. 757 | 3 | +0. 026 | OH—Ca I | B |
| | | 19 | 28 | 5+22 | 31825. 88* | 3141. 190 | 3141. 181 | 0 | -0. 009 | Ca I | M |
| | | 19' | | 205 | 31807. 44 | 3143. 011 | 3143. 016 | 1 | +0. 005 | OH | P |
| | | | | 2 | 31803. 39 | 3143. 412 | | | | | A |
| | 12 | | | 459 | 31799. 49 | 3143. 797 | 3143. 764 | 4 | -0. 033 | Ti II CH—OH | B |
| 8 | | 19' | 19' | 2 | 31786. 16 | 3145. 115 | 3145. 091 | 3 | -0. 024 | Fe I—Cr II | M |
| | | 19 | | 194 | 31782. 09 | 3145. 518 | 3145. 526 | 0 | +0. 008 | OH | P |
| | | | | 26 | 31781. 47 | 3145. 579 | | | -0. 053 | | M |
| | | | | 30+15 | 31765. 06* | 3147. 195 | 3147. 235 | 3 | +0. 040 | Cr II | M |
| | 12 | | | 407 | 31762. 53 | 3147. 456 | 3147. 447 | 1 | -0. 009 | OH—OH | B |
| | | 20 | 29 | 3 | 31758. 54 | 3147. 851 | | | | | A |
| | | | 29 | 159 | 31738. 44 | 3149. 844 | 3149. 852 | 2 | +0. 008 | OH | P |
| | 13 | | | 3 | 31731. 99 | 3150. 485 | 3150. 512 | -2 | +0. 027 | | M |
| | | | | 405 | 31726. 79 | 3151. 001 | 3151. 005 | 1 | +0. 004 | OH | P |
| | 13' | 13 | 20 | 151 | 31713. 78 | 3152. 293 | 3152. 262 | 5 | -0. 031 | Ti II—OH | B |
| 9 | | | | 23 | 31694. 26 | 3154. 235 | 3154. 200 | 3 | -0. 035 | Fe II Ti II | M |
| | | | | 363 | 31691. 53 | 3154. 507 | 3154. 493 | 1 | -0. 014 | OH Fe I | B |
| | | | | 21+143 | 31690. 39* | 3154. 621 | 3154. 643 | 0 | +0. 022 | OH | P |
| | | 21 | | 122 | 31665. 38 | 3157. 112 | 3157. 143 | 1 | +0. 031 | OH—Fe I _P | B |
| | 14 | | 30 | 2 | 31657. 83 | 3157. 865 | 3157. 882 | 1 | +0. 017 | Fe I—V II | M |
| | | 21 | 30 | 350 | 31651. 40 | 3158. 507 | 3158. 521 | 0 | +0. 014 | OH | P |
| | | | 30 | 115 | 31641. 40 | 3159. 505 | 3159. 531 | 1 | +0. 026 | Ni I OH—Cr I | B |
| | 14' | | | 2 | 31631. 34 | 3160. 510 | | | | | A |
| | | | | 17 | 31620. 45 | 3161. 598 | | | | | A |
| 10 | 14 | | | 318 | 31617. 51 | 3161. 892 | 3161. 901 | 0 | +0. 009 | OH | P |
| | | 22 | | 17 | 31595. 81 | 3164. 064 | 3164. 068 | 0 | +0. 004 | CH | M |
| | 15 | | 22 | 92 | 31588. 27 | 3164. 819 | 3164. 833 | 1 | +0. 014 | V II OH | B |
| | | | | 297 | 31573. 14 | 3166. 336 | 3166. 335 | 0 | -0. 001 | OH | P |
| | | | | 88 | 31564. 85 | 3167. 168 | 3167. 177 | 1 | +0. 009 | OH | P |
| | 15' | 15 | 31 | 1 | 31550. 49 | 3168. 609 | | | | | A |
| | | | | 13 | 31543. 65 | 3169. 296 | | | | | A |
| | | | | 272+7 | 31540. 50* | 3169. 613 | 3169. 616 | 0 | +0. 003 | OH | P |
| | | 23 | 31 | 1 | 31523. 80 | 3171. 292 | | | | | A |
| | | | 31 | 68 | 31506. 92 | 3172. 991 | 3172. 997 | 1 | +0. 006 | OH | P |
| 11 | 16 | | | 14 | 31498. 73 | 3173. 816 | 3173. 840 | -2 | +0. 024 | OH | P |
| | | 23 | | 248 | 31492. 12 | 3174. 482 | 3174. 490 | 1 | +0. 008 | OH | P |
| | 16' | 16 | | 65+2 | 31484. 02* | 3175. 299 | 3175. 314 | 1 | +0. 015 | OH Fe I | B |
| | | | | 10 | 31463. 81 | 3177. 339 | 3177. 302 | 2 | -0. 037 | Co I—CH | M |
| | | | | 228 | 31460. 48 | 3177. 675 | 3177. 680 | -1 | +0. 005 | OH | P |
| | 17 | | 24 | 50 | 31421. 22 | 3181. 645 | 3181. 641 | -1 | -0. 004 | OH | P |
| | | | | 186 | 31408. 19 | 3182. 965 | 3182. 990 | 3 | +0. 025 | Fe I—Ni I | M |
| 12 | 17' | | 32 | 1+1 | 31406. 08 | 3183. 180 | | | | | A |
| | | | | 11+48 | 31398. 78 | 3183. 919 | 3183. 964 | 2 | +0. 045 | V I | M |
| | | | | 7 | 31380. 97 | 3185. 727 | | | | | A |
| | 17 | | | 188+3+3 | 31377. 45* | 3186. 084 | 3186. 104 | 0Nd? | +0. 020 | OH | P |
| | | 25 | | 37 | 31331. 06 | 3190. 802 | 3190. 849 | 2 | +0. 047 | Fe I | M |
| | | | | 164 | 31321. 42 | 3191. 784 | 3191. 799 | -1 | +0. 015 | OH | P |
| | 18 | | 25 | 35 | 31308. 97 | 3193. 053 | 3193. 054 | -1 | +0. 001 | OH | P |

TABLE 2. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi (0, 0)$ —Continued

| O ₂ | Laboratory | | | | | | | Sun | | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|-------|--|--|--|--|
| | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | S ₁ | Intensity | Wave number cm ⁻¹ | Wavelength A | Wavelength A | Disk int. Rowl. est. | ⊖—lab. A | Solar identification | Notes | | | | |
| 286 | 13 | 18' | 18 | 26 | 26 | 26 | 26 | 8 | 31296. 74 | 3194. 301 | | | | | A | | | | |
| | | | | | | | | 5 | 31295. 11 | 3194. 467 | | | | | A | | | | |
| | | | | | | | | 158 | 31291. 38 | 3194. 848 | 3194. 849 | 0 | +0. 001 | OH Ce II? | B | | | | |
| | | | | | | | | 26 | 31236. 22 | 3200. 489 | 3200. 469 | 5Nd? | -0. 020 | Ni I— Fe I | M | | | | |
| | | | | | | | | 133 | 31231. 62 | 3200. 961 | 3200. 962 | 1 | +0. 001 | OH | P | | | | |
| | 14 | 19' | 19 | 27 | 27 | 27 | 27 | 25 | 31214. 52 | 3202. 715 | 3202. 695 | 0 | -0. 020 | CH OH | B | | | | |
| | | | | | | | | 4 | 31206. 13 | 3203. 576 | | | | | A | | | | |
| | | | | | | | | 124+2 | 31202. 23* | 3203. 977 | 3203. 980 | 1 | +0. 003 | OH | P | | | | |
| | | | | | | | | 6 | 31191. 94 | 3205. 034 | | | | | A | | | | |
| | | | | | | | | 102 | 31138. 83 | 3210. 500 | 3210. 480 | 1 | -0. 020 | OH | P | | | | |
| | 15 | 20' | 20 | 28 | 28 | 28 | 28 | 19 | 31136. 65 | 3210. 725 | 3210. 724 | -1 | -0. 001 | CH OH | B | | | | |
| | | | | | | | | 18 | 31115. 28 | 3212. 934 | 3212. 892 | 2N | -0. 042 | Mn τ | M | | | | |
| | | | | | | | | 3 | 31113. 99 | 3213. 063 | | | | | A | | | | |
| | | | | | | | | 95+4 | 31109. 97* | 3213. 479 | 3213. 474 | -1 | -0. 005 | OH | P | | | | |
| | | | | | | | | 5 | 31084. 69 | 3216. 092 | | | | | A | | | | |
| | 16 | 21' | 21 | 28 | 28 | 28 | 28 | 78 | 31042. 95 | 3220. 420 | 3220. 433 | 0 | +0. 013 | OH | P | | | | |
| | | | | | | | | 13 | 31032. 05 | 3221. 548 | 3221. 545 | -2 | -0. 003 | OH | P | | | | |
| | | | | | | | | 2 | 31018. 77 | 3222. 927 | 3222. 944 | -2 | +0. 017 | Fe II? | M | | | | |
| | | | | | | | | 74 | 31014. 52 | 3223. 369 | 3223. 364 | -1 | -0. 005 | OH | P | | | | |
| | | | | | | | | 13 | 31011. 01 | 3223. 734 | 3223. 744 | -2 | +0. 010 | OH? | P | | | | |
| | 17 | 22' | 22 | 29 | 29 | 29 | 29 | 4 | 30975. 13 | 3227. 468 | | | | | A | | | | |
| | | | | | | | | 60 | 30943. 87 | 3230. 729 | 3230. 727 | 1 | -0. 002 | OH Mn I | B | | | | |
| | | | | | | | | 9 | 30922. 38 | 3232. 974 | 3232. 938 | 2 | -0. 036 | Ni I | M | | | | |
| | | | | | | | | 1 | 30920. 28 | 3233. 193 | 3233. 167 | -1 | -0. 026 | Ni I | M | | | | |
| | | | | | | | | 56 | 30915. 87 | 3233. 654 | 3233. 669 | -1 | +0. 015 | OH | P | | | | |
| | 18 | 23 | 23 | 30 | 30 | 30 | 30 | 9 | 30901. 59 | 3235. 149 | | | | | A | | | | |
| | | | | | | | | 3+1 | 30863. 24* | 3239. 170 | | | | | A | | | | |
| | | | | | | | | 45 | 30841. 55 | 3241. 447 | 3241. 489 | 0 | +0. 042 | Fe I | M | | | | |
| | | | | | | | | 42+35 | 30813. 99* | 3244. 346 | 3244. 354 | 0N | +0. 008 | OH | P | | | | |
| | | | | | | | | 6 | 30807. 15 | 3245. 067 | | | | | A | | | | |
| | 19 | 24 | 24 | 31 | 31 | 31 | 31 | 6 | 30786. 72 | 3247. 220 | | | | | A | | | | |
| | | | | | | | | 2 | 30748. 87 | 3251. 218 | | | | | A | | | | |
| | | | | | | | | 33 | 30735. 83 | 3252. 597 | 3252. 609 | 0N | +0. 012 | OH | P | | | | |
| | | | | | | | | 32 | 30708. 50 | 3255. 491 | 3255. 497 | 1 | +0. 006 | OH— | B | | | | |
| | | | | | | | | 4 | 30686. 32 | 3257. 812 | 3257. 823 | 1 | +0. 011 | Cr I | M | | | | |
| | 20 | 25 | 25 | 31 | 31 | 31 | 31 | 4 | 30666. 26 | 3259. 976 | 3259. 989 | 4 | +0. 013 | Fe I Cr I | M | | | | |
| | | | | | | | | 1 | 30632. 23 | 3263. 597 | | | | | A | | | | |
| | | | | | | | | 24 | 30626. 72 | 3264. 185 | 3264. 185 | -1N | 0. 000 | OH | P | | | | |
| | | | | | | | | 23 | 30599. 58 | 3267. 080 | 3267. 062 | 1 | -0. 018 | Fe II—OH | B | | | | |
| | | | | | | | | 3 | 30539. 85 | 3273. 740 | 3273. 720 | -3 | -0. 020 | | M | | | | |
| | 21 | 26 | 26 | 32 | 32 | 32 | 32 | 17 | 30514. 00 | 3276. 243 | 3276. 262 | -1 | +0. 019 | OH | P | | | | |
| | | | | | | | | 17 | 30487. 11 | 3279. 133 | 3279. 154 | 1 | +0. 021 | OH | P | | | | |
| | | 27 | 27 | | | | | 12 | 30397. 55 | 3288. 795 | 3288. 813 | 0 | +0. 018 | Zr II | M | | | | |
| | | | | | | | | 12 | 30370. 91 | 3291. 679 | 3291. 697 | -1 | +0. 018 | Fe I | M | | | | |
| | 28 | 27 | | | | | | 9 | 30277. 26 | 3301. 862 | 3301. 869 | -3 | +0. 007 | OH? Pt I | B | | | | |

| | | | | | | | | | | | | |
|----|----|--|--|--|---|-----------|-----------|-----------|------|---------|-----------|---|
| 29 | 28 | | | | 8 | 30250. 81 | 3304. 749 | 3304. 754 | -1N | +0. 005 | OH?— | B |
| | | | | | 6 | 30153. 06 | 3315. 462 | | | | A | A |
| 29 | | | | | 6 | 30126. 65 | 3318. 369 | 3318. 367 | 1Nd? | -0. 002 | Ti I—Co I | M |
| 30 | | | | | 4 | 30024. 67 | 3329. 641 | 3329. 632 | -3N | -0. 009 | Fe I | M |
| 30 | | | | | 4 | 29998. 38 | 3332. 558 | 3332. 576 | -3N | +0. 018 | | M |
| 31 | | | | | 3 | 29891. 82 | 3344. 439 | | | | | A |
| 31 | | | | | 3 | 29865. 33 | 3347. 371 | 3347. 375 | -2 | +0. 004 | | M |
| 32 | | | | | 2 | 29754. 34 | 3359. 892 | | | | | A |
| 32 | | | | | 2 | 29728. 27 | 3362. 839 | | | | | A |

* Blend.

TABLE 3. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi$ (1,1)

| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | Laboratory | | | | | Sun | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|
| | | | | | R ₁ | R ₂ | S ₁ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖-lab. Å | Solar identification |
| | | | | | 3 | 5 | 32147. 10 | 3109. 801 | 3109. 803 | -3 | +0. 002 | OH? | P | |
| | | | | | 2 | 4 | 32101. 06 | 3114. 262 | | | | | A | |
| | | | | | 1 | 3 | 32053. 54 | 3118. 879 | | | | | A | |
| | | | 8 | | 67 | 32025. 16 | 3121. 643 | 3121. 604 | 3 | -0. 039 | Ti II Co I | M | | |
| | | | 7 | | 68 | 32023. 93 | 3121. 762 | 3121. 783 | 1 | +0. 021 | OH Fe I | B | | |
| | | | 9,8' | | 65+9 | 32022. 86 | 3121. 867 | 3121. 859 | -1 | -0. 008 | Cr II—OH | B | | |
| | | | 7' | | 11+10 | 32021. 98* | 3121. 953 | 3121. 969 | -1 | +0. 016 | Cr II | M | | |
| | | | 9' | | 7 | 32020. 56 | 3122. 091 | 3122. 079 | 0 | -0. 012 | Ti II | M | | |
| | | | 6 | | 63+8 | 32019. 34* | 3122. 210 | 3122. 219 | 0 | +0. 009 | OH CH | B | | |
| | | | 6' | | 13 | 32017. 81 | 3122. 360 | | | | | A | | |
| | | | 10 | | 62 | 32016. 73 | 3122. 465 | | | | | A | | |
| | | | 10' | | 6 | 32014. 36 | 3122. 696 | 3122. 664 | -1 | -0. 032 | Fe I | M | | |
| | | | 5 | | 57 | 32011. 67 | 3122. 958 | 3122. 949 | -1 | -0. 009 | OH | P | | |
| | | | 5' | | 16 | 32010. 25 | 3123. 096 | 3123. 092 | 0 | -0. 004 | Ti I | M | | |
| | | | 11 | | 57 | 32006. 79 | 3123. 434 | 3123. 443 | -1 | +0. 009 | OH | P | | |
| | | | 11' | | 4 | 32004. 20 | 3123. 687 | 3123. 698 | -3 | +0. 011 | Fe II? | M | | |
| | | | 4 | | 48+531 | 32001. 56* | 3123. 945 | 3123. 959 | 1 | +0. 014 | OH | M | | |
| | | | 4' | | 18 | 32000. 03 | 3124. 094 | 3124. 097 | 0 | +0. 003 | Fe I | M | | |
| | | | 12 | | 51 | 31992. 79 | 3124. 801 | 3124. 803 | -1 | +0. 002 | OH—Ge I | B | | |
| | | | 12' | | 3 | 31990. 07 | 3125. 067 | 3125. 053 | 2 | -0. 014 | Cr II—CH | M | | |
| | | | 3 | | 37 | 31988. 34 | 3125. 236 | 3125. 288 | 5 | { +0. 052 } | V II | { M } | | |
| | | | 3' | | 20 | 31987. 38 | 3125. 329 | | 5 | | | | | |
| | | | 9 | | 60 | 31977. 16 | 3126. 329 | 3126. 332 | -2 | { -0. 041 } | OH | { P } | | |
| | | | 8 | | 61 | 31975. 78 | 3126. 464 | 3126. 472 | -1 | | OH | | | |
| | | | 13 | | 45 | 31974. 59 | 3126. 580 | 3126. 617 | 1 | { +0. 037 } | CH OH OH | { B } | | |
| | | | 10 | | 57 | 31974. 20 | 3126. 618 | | 1 | | | | | |
| | | | 2 | | 24 | 31973. 63 | 3126. 674 | | | | | A | | |
| | | | 2' | | 20 | 31972. 91 | 3126. 745 | 3126. 767 | 1 | +0. 022 | Fe I | M | | |
| | | | 13' | | 3 | 31971. 62 | 3126. 871 | 3126. 847 | 0 | -0. 024 | Fe II | M | | |
| | | | 7 | | 62 | 31969. 91 | 3127. 038 | 3127. 047 | -1 | +0. 009 | OH | P | | |
| | | | 11 | | 53+6 | 31966. 74* | 3127. 347 | 3127. 362 | 0 | +0. 015 | OH | P | | |

TABLE 3. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi (1,1)$ —Continued

| Laboratory | | | | | | | | Sun | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|---------------------------------|----------------------------|----------------------------|-------------------------|--------------------|----------------------|-------|
| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | S ₁ | Intensity $I_{\text{lab.}} / I_{\text{sun}}$ | Wave number cm^{-1} | Wavelength \AA | Wavelength \AA | Disk int. Rowl. est. | \odot -lab. A | Solar identification | Notes |
| | | | | | 6 | | | 57 | 31959.51 | 3128.055 | 3128.086 | 0N | +0.031 | OH—OH | B |
| | | | | | 1 | | | 11 | 31957.78 | 3128.224 | | | | | A |
| | | | | | 1' | | | 16+492 | 31957.20* | 3128.281 | 3128.289 | 1 | +0.008 | Sc II OH | M |
| | | | | | 12 | | | 48+36 | 31954.81* | 3128.515 | 3128.521 | 0 | +0.006 | OH | P |
| | | | | | 14 | | | 39 | 31952.12 | 3128.776 | 3128.776 | -1 | -0.003 | OH Y II? | B |
| | | | | | 14' | | | 2 | 31948.91 | 3129.093 | 3129.107 | 1 | +0.014 | Fe I | M |
| | | | | | 5 | | | 51 | 31944.43 | 3129.532 | 3129.532 | -1N | 0.000 | OH | P |
| | | | | | 13 | | | 43 | 31938.40 | 3130.123 | 3130.137 | -1N | +0.014 | OH—Ti I | B |
| | | | | | 15 | | | 33 | 31925.20 | 3131.418 | 3131.446 | 0 | +0.028 | OH | P |
| | | | | | 4 | | | 43 | 31924.40 | 3131.496 | 3131.526 | 0 | +0.030 | OH—Cr II | B |
| | | | | | 15' | | | 2 | 31921.78 | 3131.753 | | | | | A |
| | | | | | 14 | | | 37 | 31917.40 | 3132.182 | 3132.189 | 0 | +0.007 | OH | P |
| | | | | | 3 | | | 32 | 31899.00 | 3133.989 | 3133.966 | -1d? | -0.023 | Fe IIp—OH | B |
| | | | | | 16 | | | 28 | 31893.67 | 3134.514 | | -2 | {+0.027} | OH—OH | {B} |
| | | | | | | | | 37 | 31893.01 | 3134.578 | 3134.541 | | {-0.037} | | {B} |
| | | | | | 1' | | | 26 | 31892.80 | 3134.599 | 3134.626 | -1 | +0.027 | OH | P |
| | | | | | 15 | | | 31 | 31891.72 | 3134.705 | 3134.716 | -1 | +0.011 | OH Hf II | B |
| | | | | | 16' | | | 1 | 31890.01 | 3134.873 | | | | | A |
| | | | | | 2 | | | 68 | 31876.78 | 3136.174 | | | | | B |
| | | | | | 2' | | | 24 | 31876.24 | 3136.227 | 3136.195 | 0 | {+0.021} | OH Fe I | {M} |
| | | | | | 2 | | | 22 | 31867.82 | 3137.056 | 3137.025 | 0 | -0.031 | Co I?—OH | B |
| | | | | | 16 | | | 26 | 31861.28 | 3137.705 | 3137.710 | -1 | +0.005 | OH | P |
| | | | | | 3 | | | 39 | 31860.78 | 3137.749 | 3137.765 | 0 | +0.016 | Co I—OH | B |
| | | | | | 3' | | | 96 | 31859.31 | 3137.894 | 3137.896 | -1 | +0.002 | OH | P |
| | | | | | | | | 20 | 31858.55 | 3137.969 | | | | | A |
| | | | | | 17 | | | 23 | 31857.39 | 3138.083 | 3138.076 | -1 | -0.007 | V II—OH | B |
| | | | | | 17' | | | 1 | 31853.65 | 3138.452 | | | | | A |
| | | | | | 4 | | | 120 | 31840.07 | 3139.791 | 3139.761 | 1 | -0.030 | V II Sc II—OH | B |
| | | | | | 4' | | | 17 | 31839.10 | 3139.886 | | | | | A |
| | | | | | | | | 9+445 | 31830.53* | 3140.731 | 3140.757 | 3 | +0.026 | OH—Ca I | M |
| | | | | | 5 | | | 22+5 | 31825.88* | 3141.190 | 3141.181 | 0 | -0.009 | Ca I | M |
| | | | | | 5' | | | 139 | 31818.60 | 3141.909 | 3141.908 | 2 | -0.001 | —OH | B |
| | | | | | | | | 15 | 31817.44 | 3142.023 | 3142.021 | -2 | -0.002 | OH | P |
| | | | | | 18 | | | 18 | 31816.17 | 3142.142 | 3142.156 | -2 | +0.014 | OH—V II? | B |
| | | | | | | | | 52 | 31812.39 | 3142.522 | 3142.511 | -2 | -0.011 | OH | P |
| | | | | | 6 | | | 152 | 31794.56 | 3144.284 | 3144.326 | 0 | +0.042 | CH OH? | B |
| | | | | | 6' | | | 12 | 31793.15 | 3144.424 | 3144.453 | 1 | +0.029 | CH Cr I | M |
| | | | | | | | | 17 | 31785.59 | 3145.172 | 3145.136 | 2 | -0.036 | Ni I— | M |
| | | | | | 2' | | | 15 | 31772.13 | 3146.504 | | | | | A |
| | | | | | 2, 3' | | | 43+16 | 31771.57 | 3146.560 | | | {+0.038} | CH—CH OH | M |
| | | | | | 3 | | | 68 | 31770.85 | 3146.631 | | 1 | {-0.033} | | B |
| | | | | | 19 | | | 15 | 31770.03 | 3146.712 | | | | | A |
| | | | | | 7' | | | 158 | 31767.67 | 3146.946 | 3146.934 | 1 | -0.012 | OH | P |
| | | | | | 1, 1' | | | 10+22+11 | 31766.00 | 3147.112 | | | | | A |
| | | | | | 4' | | | 15+30 | 31765.06* | 3147.195 | 3147.235 | 3 | +0.040 | Cr II | M |

| | | | | | | | | | | |
|----|-----|----|---------|-----------|----------|----------|----|--------|----------------------|---|
| 3 | 4 | 19 | 93 | 31764.36 | 3147.274 | 3147.267 | 2 | -0.007 | Fe I—OH | B |
| | | | 65 | 31762.99 | 3147.410 | 3147.447 | 1 | +0.037 | OH—OH | B |
| | | | 13 | 31753.91 | 3148.309 | 3148.307 | -1 | -0.002 | —OH? | B |
| | | | 112 | 31752.72 | 3148.427 | 3148.440 | 3 | +0.013 | Fe I OH Cr I | B |
| | 5' | | 14 | 31740.03 | 3149.687 | | | | | A |
| 1' | 8' | 20 | 163+11 | 31737.73 | 3149.915 | 3149.898 | 1 | -0.017 | OH | P |
| | | | 8+127 | 31736.31 | 3150.056 | 3150.077 | 1 | +0.021 | OH—Cr II | B |
| | | | 22 | 31733.71 | 3150.314 | 3150.307 | 1 | -0.007 | —OH | B |
| | | | 12 | 31718.69 | 3151.806 | | | | | A |
| | 6 | | 9 | 31717.10 | 3151.964 | | | | | A |
| 4 | 2' | 20 | 136 | 31715.47 | 3152.125 | 3152.117 | 0 | -0.008 | OH | P |
| | | | 76 | 31712.16 | 3152.454 | 3152.457 | -1 | +0.003 | OH | P |
| | | | 24 | 31707.21 | 3152.947 | 3152.957 | 0 | +0.010 | OH—OH | B |
| | | | 18 | 31707.01 | 3152.967 | | -1 | -0.010 | Fe I OH | B |
| | 2 | | 156 | 31704.62 | 3153.204 | 3153.191 | 3 | -0.013 | | B |
| 3' | 9' | 20 | 6 | 31702.60 | 3153.405 | | | | | A |
| | | | 8 | 31692.20 | 3154.445 | 3154.420 | 1 | -0.025 | Fe I | M |
| | | | 143+21 | 31690.39* | 3154.621 | 3154.595 | 0 | -0.026 | Ni I—OH | B |
| | | | 11 | 31689.32 | 3154.727 | | | | | A |
| | 8 | | 25 | 31674.69 | 3156.184 | 3156.190 | -3 | +0.006 | OH | P |
| 3 | 10' | 21 | 33 | 31674.12 | 3156.241 | 3156.272 | 2 | +0.031 | Fe I | M |
| | | | 148 | 31668.20 | 3156.831 | 3156.845 | 0 | +0.014 | OH | P |
| | | | 5 | 31665.98 | 3157.052 | 3157.031 | 2 | -0.021 | Fe I | M |
| | | | 6 | 31663.32 | 3157.317 | 3157.294 | 0 | -0.023 | | M |
| | 10 | | 9 | 31661.95 | 3157.454 | | | | | A |
| 5 | 4' | 21 | 138 | 31661.26 | 3157.523 | 3157.501 | 1N | -0.022 | —OH | B |
| | | | 85 | 31659.36 | 3157.712 | 3157.751 | 0 | +0.039 | CH OH? | B |
| | | | 23 | 31636.55 | 3159.989 | | | | | A |
| | | | 48 | 31635.77 | 3160.067 | 3160.082 | -1 | +0.015 | OH—Cr II | B |
| | 4 | | 8 | 31633.08 | 3160.336 | 3160.347 | 1 | +0.011 | Fe I | M |
| 3 | 11' | 21 | 5 | 31630.38 | 3160.605 | 3160.612 | -1 | +0.007 | Cr I CH | M |
| | | | 137+133 | 31628.22 | 3160.821 | 3160.801 | 1 | -0.020 | V II—OH | B |
| | | | 4 | 31625.95 | 3161.048 | 3161.033 | 0 | -0.015 | Mn I | M |
| | | | 7 | 31610.35 | 3162.609 | 3162.570 | 4 | -0.039 | Ti II | M |
| | 10 | | 92 | 31604.30 | 3163.214 | 3163.223 | 0 | +0.009 | OH | P |
| 6 | 5' | 22 | 7 | 31599.67 | 3163.678 | 3163.683 | -3 | +0.005 | | M |
| | | | 20+4 | 31593.48 | 3164.297 | 3164.295 | 1 | -0.002 | Fe I Zr II | B |
| | | | 60 | 31592.51 | 3164.394 | 3164.418 | 0 | +0.024 | OH | P |
| | | | 124 | 31590.97 | 3164.548 | 3164.548 | 0 | 0.000 | OH | P |
| | 5 | | 124 | 31584.96 | 3165.151 | 3165.157 | 1 | +0.006 | OH Fe I _P | B |
| 7 | 12' | 22 | 3 | 31582.40 | 3165.407 | 3165.420 | -1 | +0.013 | Zr II | M |
| | | | 6 | 31571.17 | 3166.534 | | | | | A |
| | | | 3 | 31552.55 | 3168.402 | | | | | A |
| | | | 114 | 31549.90 | 3168.668 | 3168.672 | 0 | +0.004 | OH | P |
| | 12 | | 95 | 31546.77 | 3168.982 | 3168.955 | 1 | -0.027 | —OH | B |
| 4 | 6' | 22 | 18 | 31546.02 | 3169.058 | 3169.075 | -2 | +0.017 | OH—Fe I _P | B |
| | | | 69 | 31544.86 | 3169.174 | 3169.192 | -2 | +0.018 | OH—Cr II | B |
| | | | 7+272 | 31540.50* | 3169.613 | 3169.616 | 0 | +0.003 | OH | M |
| | | | 110 | 31537.98 | 3169.866 | 3169.861 | 0 | -0.005 | OH | P |
| | 6 | | 2 | 31535.18 | 3170.148 | 3170.128 | -1 | -0.020 | | M |

TABLE 3. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi$ (1,1)—Continued

| Laboratory | | | | | | | | | Sun | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------|---------------------------------|-----------------|-----------------|-------------------------|--------------------|-------------------------------------|-------|--|--|
| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | S ₁ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖—lab. Å | Solar identification | Notes | | |
| 290 | 5 | 7' | 13' | 13 | 23 | 23 | | 5 | 31531. 66 | 3170. 502 | 3170. 481 | -1 | -0. 021 | OH | M | | |
| | | | | | | | | 2 | 31508. 67 | 3172. 815 | 3173. 210 | 0 | +0. 012 | | A | | |
| | | | | | | | | 101 | 31504. 86 | 3173. 198 | | | OH | P | | | |
| | | | | | | | | 5 | 31503. 56 | 3173. 329 | 3174. 221 | 0 | -0. 014 | Fe ip | A | | |
| | | | | | | | | 15 | 31494. 57 | 3174. 235 | | | | | M | | |
| | 8 | 7 | 14 | 14' | 24 | 24 | | 75 | 31493. 16 | 3174. 377 | 3174. 380 | 0 | +0. 003 | OH | P | | |
| | | | | | | | | 96 | 31487. 30 | 3174. 968 | 3174. 953 | 1 | -0. 015 | OH | P | | |
| | | | | | | | | 95 | 31486. 60 | 3175. 039 | 3175. 045 | 0 | +0. 006 | Sn ₁ OH | B | | |
| | | | 14' | 2+65 | | | | 31484. 02* | 3175. 299 | 3175. 314 | 1 | +0. 015 | OH Fe ₁ | M | | | |
| | | | | | | | | 6 | 31464. 92 | 3177. 227 | A | | | | | | |
| | 9 | 8' | 14' | 14 | 24 | 24 | | 2 | 31458. 98 | 3177. 826 | 3177. 822 | -1d? | -0. 004 | OH | M | | |
| | | | | | | | | 4 | 31457. 66 | 3177. 960 | A | | | | | | |
| | | | | | | | | 89 | 31455. 88 | 3178. 140 | 3178. 161 | 1 | +0. 021 | OH | P | | |
| | | | | | | | | 12 | 31439. 22 | 3179. 824 | A | | | | | | |
| | | | | | | | | 78 | 31437. 64 | 3179. 984 | 3179. 966 | -1 | -0. 018 | OH | P | | |
| | 6 | 9' | 15 | 15' | 24 | 24 | | 82 | 31432. 83 | 3180. 470 | 3180. 491 | 0 | +0. 021 | OH | P | | |
| | | | | | | | | 1+4 | 31429. 95 | 3180. 762 | 3180. 746 | 2 | -0. 016 | Fe ₁ | M | | |
| | | | | | | | | 95 | 31423. 71 | 3181. 393 | 3181. 420 | 0 | +0. 027 | OH Cr _{II} | B | | |
| | | | | | | | | 1+1 | 31406. 08* | 3183. 180 | 3183. 520 | -2 | +0. 011 | | A | | |
| | | | | | | | | 76 | 31402. 83 | 3183. 509 | | | OH | P | | | |
| | 10 | 10' | 9 | 9 | 25 | 25 | | 6 | 31385. 40 | 3185. 277 | 3185. 804 | -2N | +0. 009 | OH | A | | |
| | | | | | | | | 10 | 31380. 30 | 3185. 795 | | | | OH | P | | |
| | | | | | | | | 81 | 31378. 50 | 3185. 977 | 3185. 979 | 0 | +0. 002 | OH | P | | |
| | | | | | | | | 3+188+3 | 31377. 45* | 3186. 084 | 3186. 104 | 0Nd? | +0. 020 | OH | M | | |
| | | | | | | | | 69 | 31374. 47 | 3186. 387 | 3186. 383 | 0 | -0. 004 | OH | P | | |
| | 7 | 11 | 16 | 16' | 25 | 25 | | 1+9 | 31370. 78* | 3186. 762 | 3186. 752 | 3 | -0. 010 | Fe _{II} | M | | |
| | | | | | | | | 88 | 31358. 00 | 3188. 010 | 3188. 034 | 1 | +0. 024 | OH Cr _I | B | | |
| | | | | | | | | 1+3 | 31350. 14 | 3188. 860 | 3189. 317 | 0 | +0. 005 | OH | A | | |
| | | | | | | | | 64 | 31345. 70 | 3189. 312 | | | | A | | | |
| | | | | | | | | 8+8 | 31317. 74* | 3192. 158 | | | | A | | | |
| | 12 | 12' | 17 | 17' | 26 | 26 | | 76 | 31315. 80 | 3192. 356 | 3192. 396 | 0 | +0. 040 | Fe _I | M | | |
| | | | | | | | | 57+7 | 31312. 12* | 3192. 732 | 3192. 724 | -2 | -0. 008 | OH | P | | |
| | | | | | | | | 1 | 31308. 07 | 3193. 145 | 3193. 734 | -1N | -0. 023 | Fe ip Fe _{II} pr | A | | |
| | | | | | | | | 5 | 31302. 07 | 3193. 757 | | | | | M | | |
| | | | | | | | | 82 | 31289. 40 | 3195. 051 | 3195. 085 | 0 | +0. 034 | CH OH | B | | |
| | 11 | 11' | 17 | 17' | 26 | 26 | | 1 | 31288. 59 | 3195. 133 | 3195. 140 | -1 | +0. 007 | Ru _{II} CH | M | | |
| | | | | | | | | 54 | 31284. 47 | 3195. 554 | 3195. 593 | 2 | +0. 039 | Ni _I —Y _{II} | M | | |
| | | | | | | | | 2, 3 | 31264. 35* | 3197. 610 | 3197. 596 | -1 | -0. 014 | V _{II} ?—CH | M | | |
| | | | | | | | | 6 | 31251. 95 | 3198. 879 | 3198. 902 | -2N | +0. 023 | Fe _I ?—Ir _I ? | M | | |
| | | | | | | | | 72+3 | 31249. 76* | 3199. 103 | 3199. 137 | 0 | +0. 034 | OH— | B | | |
| | 8 | 12 | 18 | 18 | 18 | 18 | | 46+3 | 31245. 66* | 3199. 523 | 3199. 527 | 4 | +0. 004 | Fe _I | M | | |
| | | | | | | | | 43 | 31219. 00 | 3202. 255 | 3202. 257 | -1 | +0. 002 | OH | P | | |
| | | | | | | | | 75 | 31217. 83 | 3202. 376 | 3202. 382 | 0 | +0. 006 | IV _I OH | B | | |
| | | | | | | | | 4 | 31215. 09 | 3202. 657 | 3202. 667 | 0 | +0. 010 | Fe ip | M | | |
| | | | | | | | | 5 | 31182. 67 | 3205. 986 | 3206. 007 | 1 | +0. 021 | Ti _{II} | M | | |

| | | | | | | | | | | | |
|----|-----|----|----|---------|------------|-----------|-----------|------|---------|-------------|---|
| | | | | 67 | 31180. 23 | 3206. 237 | 3206. 238 | 0 | +0. 001 | OH | P |
| | | | | 37 | 31175. 02 | 3206. 773 | 3206. 763 | 0Nd? | -0. 010 | -OH | B |
| | | | | 35+14 | 31149. 18* | 3209. 433 | 3209. 434 | -1 | +0. 001 | OH | P |
| | | | | 67 | 31143. 17 | 3210. 043 | 3210. 046 | 0 | +0. 003 | OH | P |
| | | | | 3+3 | 31124. 70* | 3211. 958 | | | | | A |
| 9 | 12 | 19 | 19 | | | | | | | | |
| | 13 | | | 4+95 | 31109. 97* | 3213. 479 | 3213. 474 | -1 | -0. 005 | OH | M |
| | 13' | | | 60 | 31107. 44 | 3213. 740 | 3213. 744 | 0 | +0. 004 | OH-Fe I | B |
| | 13 | 20 | 20 | 29 | 31100. 10 | 3214. 499 | 3214. 494 | -2 | -0. 005 | OH | P |
| | 14 | | | 27 | 31075. 04 | 3217. 091 | 3217. 097 | 1 | +0. 006 | V I V II | M |
| | 14' | | | 58+ 5+4 | 31065. 67* | 3218. 061 | 3218. 075 | -1 | +0. 014 | OH | P |
| 10 | 14 | | | 3 | 31034. 10 | 3221. 335 | | | | | A |
| | 14 | 21 | 21 | 3+53 | 31031. 29 | 3221. 627 | 3221. 659 | 2 | +0. 032 | Ni I | M |
| | 15 | | | 22 | 31020. 73 | 3222. 750 | 3222. 729 | -2N | -0. 021 | Ti I | M |
| | 15' | | | 21 | 30996. 33 | 3225. 260 | 3225. 267 | -1 | +0. 007 | OH | P |
| | 15 | 22 | 22 | 50+ 9+3 | 30984. 97* | 3226. 443 | 3226. 446 | -1 | +0. 003 | OH | P |
| 11 | 15' | | | 2 | 30954. 87 | 3228. 579 | | | | | A |
| | 15 | | | 46 | 30951. 88 | 3228. 892 | 3228. 900 | 0 | +0. 008 | Fe I OH | B |
| | 17 | | | 17+10+1 | 30936. 75* | 3231. 473 | 3231. 472 | -1 | -0. 001 | OH | P |
| | 17 | 22 | 22 | 2 | 30934. 68 | 3231. 689 | 3231. 707 | 1 | +0. 018 | Fe II Zr II | M |
| | 17 | | | 16 | 30913. 01 | 3233. 954 | 3233. 976 | 2 | +0. 022 | Fe I Mn I | M |
| 12 | 16 | | | 42 | 30901. 10 | 3235. 200 | 3235. 187 | -1 | -0. 013 | Fe I-OH | B |
| | 16' | | | 2 | 30872. 32 | 3238. 216 | 3238. 213 | -2 | -0. 003 | Ti I | M |
| | 16 | 23 | 23 | 39 | 30869. 17 | 3238. 547 | 3238. 553 | -1 | +0. 006 | OH | P |
| | 17 | | | 13 | 30848. 20 | 3240. 748 | | | | | A |
| | 17 | 23 | 23 | 2 | 30835. 17 | 3242. 118 | 3242. 108 | -3N | -0. 010 | | M |
| | 17 | | | 13 | 30824. 92 | 3243. 196 | 3243. 214 | -2 | +0. 018 | OH | P |
| | 17 | 24 | 24 | 35+42 | 30813. 99* | 3244. 346 | 3244. 354 | 0N | +0. 008 | OH | P |
| | 17 | | | 32 | 30782. 97 | 3247. 615 | 3247. 569 | 10 | -0. 046 | Cu I | M |
| | 18 | | | 9+12 | 30754. 71* | 3250. 600 | 3250. 637 | 3N | +0. 037 | Fe I | M |
| | 18 | 25 | 25 | 9 | 30731. 86 | 3253. 017 | 3253. 038 | -2 | +0. 021 | OH | P |
| | 18 | | | 29+ 2+2 | 30723. 76* | 3253. 875 | 3253. 844 | 2N | -0. 031 | Fe I | M |
| | 18 | 25 | 25 | 27 | 30693. 41 | 3257. 092 | 3257. 103 | 2 | +0. 011 | OH- Fe I | B |
| | 19 | | | 7 | 30656. 06 | 3261. 061 | 3261. 065 | -1 | +0. 004 | Cd I | M |
| | 19 | 26 | 26 | 7+ 1+1 | 30633. 70* | 3263. 441 | 3263. 466 | -3 | +0. 025 | Fe Ip | M |
| | 19 | | | 23 | 30630. 09 | 3263. 826 | 3263. 838 | 0N | +0. 012 | OH- | B |
| | 19 | 26 | 26 | 22 | 30600. 42 | 3266. 990 | 3266. 950 | 1 | -0. 040 | Fe II | M |
| | 20 | | | 5 | 30552. 13 | 3272. 154 | | | | | A |
| | 20 | 26 | 26 | 18 | 30532. 97 | 3274. 208 | 3274. 226 | 1 | +0. 018 | OH- Fe Ip | B |
| | 20 | | | 5 | 30530. 13 | 3274. 513 | | | | | A |
| | 20 | 27 | 27 | 17+7 | 30503. 90* | 3277. 328 | 3277. 358 | 7d? | +0. 030 | Fe II | M |
| | 21 | | | 3 | 30442. 80 | 3283. 906 | 3283. 933 | -1 | +0. 027 | | M |
| | 21 | 27 | 27 | 14 | 30432. 37 | 3285. 032 | 3285. 022 | 0N | -0. 010 | V II OH | B |
| | 21 | | | 3+1 | 30421. 17* | 3286. 242 | 3286. 258 | -2 | +0. 016 | Sm II | M |
| | 22 | | | 14 | 30403. 78 | 3288. 121 | 3288. 155 | 3 | +0. 034 | Ti II- | M |
| | 22 | 28 | 28 | 11 | 30328. 14 | 3296. 322 | | | | | A |
| | 22 | | | 2+5 | 30327. 68* | 3296. 372 | 3296. 377 | -2N | +0. 005 | Zr II | M |
| | 23 | | | 2 | 30306. 32 | 3298. 695 | 3298. 691 | 2 | -0. 004 | Co I | M |
| | 23 | 28 | 28 | 10 | 30299. 95 | 3299. 389 | | | | | A |
| | 23 | | | 8+4 | 30220. 11* | 3308. 106 | 3308. 111 | 0N | +0. 005 | NH | M |
| | 23 | | | 8 | 30192. 40 | 3311. 142 | 3311. 110 | 0 | -0. 032 | NH | M |

TABLE 3. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi$ (1, 1)—Continued

| Laboratory | | | | | | | | Sun | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|-------|
| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | S ₁ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖—lab. Å | Solar identification | Notes |
| 24 | 24 | | | | | | | 6 | 30108. 36 | 3320. 385 | 3320. 379 | -3 | -0. 006 | Fe I | M |
| | | | | | | | | 6 | 30081. 91 | 3323. 415 | 3323. 395 | 1 | -0. 020 | | M |
| | 25 | | | | | | | 5 | 29992. 50 | 3333. 212 | 3333. 222 | -2N | +0. 010 | | M |
| | | | | | | | | 5 | 29965. 35 | 3336. 232 | 3336. 260 | 2 | +0. 028 | | M |
| | 26 | | | | | | | 4 | 29872. 41 | 3346. 611 | 3346. 602 | -3N | -0. 009 | | M |
| | | | | | | | | 4 | 29845. 53 | 3349. 627 | 3349. 652 | -1 | +0. 025 | | M |
| | 27 | | | | | | | 3 | 29748. 07 | 3360. 601 | 3360. 607 | 0 | +0. 006 | | NH |
| | | | | | | | | 3 | 29721. 36 | 3363. 621 | 3363. 616 | 1 | -0. 005 | | Ni I |
| 28 | 27 | | | | | | | 2 | 29619. 12 | 3375. 232 | 3375. 215 | -3 | -0. 017 | | Co I? |
| | | | | | | | | 2 | 29592. 56 | 3378. 261 | | | | | A |

*Blend.

TABLE 4. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi$ (2, 2)

| Laboratory | | | | | | | | Sun | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|-------|---|
| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖—lab. Å | Solar identification | Notes | |
| 262 | | | | | | | | 7 | 31391. 16 | 3184. 692 | | | | A | |
| | | | | | | | | 6 | 31390. 37 | 3184. 772 | | | | | |
| | | | | | | | | 7' | 31389. 41 | 3184. 869 | | | | | |
| | | | | | | | | 6' | 31388. 82 | 3184. 930 | | | | | |
| | | | | | | | | 8 | 31388. 31 | 3184. 981 | | | | | |
| | | | | | | | | 5, 8' | 31386. 21 | 3185. 195 | | | | | |
| | | | | | | | | 5' | 31384. 81 | 3185. 337 | | | | | |
| | | | | | | | | 9 | 31381. 60 | 3185. 663 | 3185. 674 | 0 | +0. 011 | | M |
| | | | | | | | | 9' | 31379. 49 | 3185. 877 | | | | | |
| | | | | | | | | 4 | 31379. 00 | 3185. 927 | | | | | |
| | | | | | | | | 4' | 31377. 45* | 3186. 084 | | | | | A |
| | | | | | | | | 10 | 31370. 78* | 3186. 762 | 3186. 752 | 3 | -0. 010 | Fe II | M |
| | | | | | | | | 3, 10' | 31368. 88 | 3186. 955 | | | | | |
| | | | | | | | | 3' | 31367. 97 | 3187. 047 | | | | | |
| | | | | | | | | 2 | 31356. 63 | 3188. 200 | | | | | |
| 11, 2' | | | | | | | | 9+3 | 31355. 76 | 3188. 289 | | | | A | |
| | | | | | | | | 2+3 | 31342. 84 | 3189. 604 | | | | | |
| | | | | | | | | 8 | 31337. 94 | 3190. 101 | 3190. 104 | 1 | +0. 003 | CH | M |
| | 12 | 7 | | | | | | 9 | 31336. 18 | 3190. 280 | 3190. 294 | -2 | +0. 014 | OH | P |
| | | | | | | | | 9 | 31335. 04 | 3190. 397 | 3190. 404 | -2 | +0. 007 | OH? | P |
| 13 | | | | | | | | 6 | 31329. 35 | 3190. 976 | | | | A | |
| | | | | | | | | 10 | 31327. 37 | 3191. 178 | | | | | |
| | | | | | | | | 5 | 31317. 74* | 3192. 158 | | | | | |
| | | | | | | | | 11 | 31314. 95 | 3192. 443 | | | | | |
| | | | | | | | | 7+57 | 31312. 12* | 3192. 732 | | | | | |

| | | | | | | | | | | | |
|----|-------|----|--------|-------|------------|-----------|-----------|-----|---------|-------|------|
| | | | 4 | 6 | 31300. 75 | 3193. 892 | | | | | |
| | | 14 | 12 | 8 | 31297. 66 | 3194. 207 | | | | | |
| | 1, 1' | | | 6 | 31283. 65 | 3195. 638 | | | | | |
| | | | 3 | 5+4 | 31281. 46 | 3195. 862 | | | | | |
| | | | | 5 | 31278. 35 | 3196. 189 | | | | | |
| 1 | 2 | | 13 | 7 | 31275. 35 | 3196. 485 | | | | | |
| | 2' | | | 10 | 31264. 87 | 3197. 557 | 3197. 541 | 1 | -0. 016 | Ti II | Fe I |
| | | 15 | | 3+2 | 31264. 35* | 3197. 610 | | | | | M |
| | | | | 6 | 31250. 96 | 3198. 980 | | | | | |
| | | | | 5 | 31250. 13 | 3199. 065 | | | | | |
| | 3 | | 2 | 3+72 | 31249. 76* | 3199. 103 | | | | | |
| | 3' | | 14 | 6 | 31248. 38 | 3199. 244 | | | | | A |
| | 4 | | | 14 | 31246. 60 | 3199. 426 | | | | | |
| | | | 3+46 | | 31245. 66* | 3199. 523 | | | | | |
| | | | | 18 | 31226. 19 | 3201. 518 | 3201. 512 | -1 | -0. 006 | OH | P |
| 2 | 4' | | | 3 | 31225. 30 | 3201. 609 | | | | | |
| | | 16 | 1, 15 | 2+5 | 31216. 12 | 3202. 551 | | | | | |
| | | | | 5 | 31211. 52 | 3203. 023 | | | | | |
| | 5 | | | 8 | 31203. 85 | 3203. 810 | | | | | |
| | | | | 21 | 31203. 34 | 3203. 863 | 3203. 832 | 1 | -0. 031 | Ti I | M |
| | 5' | | 16 | 2+124 | 31202. 23* | 3203. 977 | | | | | |
| | 6 | | | 4 | 31178. 77 | 3206. 388 | | | | | |
| | 6' | | 17 | 22 | 31177. 50 | 3206. 518 | 3206. 533 | -1 | +0. 015 | OH | P |
| | | | | 2 | 31176. 21 | 3206. 651 | | | | | |
| | | | | 4 | 31167. 76 | 3207. 521 | | | | | |
| 3 | 2, 2' | | | 6+2 | 31158. 54 | 3208. 469 | | | | | |
| | 3' | | | 2 | 31157. 54 | 3208. 572 | | | | | |
| | 3 | | | 10 | 31156. 80 | 3208. 648 | | | | | |
| | 1, 1' | | 10+3+2 | | 31155. 34 | 3208. 799 | 3208. 794 | -2 | -0. 005 | OH | A |
| | 4' | | | 2 | 31150. 10 | 3209. 338 | | | | | P |
| | 7 | | 4 | 14+35 | 31149. 18* | 3209. 433 | 3209. 434 | -1 | +0. 001 | OH | M |
| | 7' | | | 24 | 31148. 53 | 3209. 500 | 3209. 489 | -2 | -0. 011 | OH | P |
| | | 5' | | 2 | 31147. 03 | 3209. 655 | | | | | |
| | | 5 | 17 | 17+4 | 31137. 29 | 3210. 659 | | | | | A |
| | | | | | 31136. 04 | 3210. 788 | | | | | |
| 1' | | 6' | | 3+3 | 31124. 70* | 3211. 958 | | | | | |
| | | | 18 | 2 | 31119. 28 | 3212. 517 | | | | | |
| | | 6 | | 3 | 31118. 57 | 3212. 590 | | | | | |
| | 8 | | | 19 | 31117. 96 | 3212. 653 | | | | | A |
| | | | | 24 | 31116. 24 | 3212. 831 | | | | | A |
| 4 | 8' | | | 1 | 31114. 57 | 3213. 003 | | | | | |
| | 2, 2' | | | 11 | 31104. 99 | 3213. 993 | | | | | A |
| | | 7' | 3+4 | | 31097. 53 | 3214. 764 | | | | | |
| | | 7 | | 1 | 31096. 72 | 3214. 848 | | | | | |
| | | | | 20 | 31095. 16 | 3215. 009 | 3215. 029 | -2N | +0. 020 | OH | P |
| | 9 | | 18 | 3 | 31087. 49 | 3215. 803 | | | | | |
| | 9' | | | 24 | 31080. 44 | 3216. 532 | 3216. 546 | 0 | +0. 014 | Cr II | M |
| | | 8' | | 1 | 31078. 50 | 3216. 732 | | | | | |
| | | 8 | | 1 | 31069. 52 | 3217. 662 | | | | | |
| | | | | 21 | 31067. 82 | 3217. 839 | 3217. 841 | 1 | +0. 002 | Ni I | M |

TABLE 4. OH in the Solar Spectrum
 $A^2\Sigma^+ - X^2\Pi (2, 2)$ —Continued

| Laboratory | | | | | | | Sun | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------|---------------------------------|-----------------|-----------------|-------------------------|-------------|----------------------|-------|
| O ₂ | P ₁ | P ₂ | Q ₁ | Q ₂ | R ₁ | R ₂ | Intensity | Wave number cm ⁻¹ | Wavelength Å | Wavelength Å | Disk int. Rowl. est. | ⊖—lab. Å | Solar identification | Notes |
| 294 | 3, 3' | 19 | 5 | 10 | 19 | 19 | 5+4+58 | 31065. 67* | 3218. 061 | 3219. 429 | -3 | -0. 006 | OH? | P |
| | | | | | | | 3 | 31063. 77 | 3218. 258 | | | | | |
| | | | | | | | 13 | 31052. 42 | 3219. 435 | | | | | |
| | | | | | | | 22 | 31041. 05 | 3220. 613 | | | | | |
| | | | | | | | 1 | 31038. 92 | 3220. 834 | | | | | |
| | 4', 4 | 19 | 6 | 10 | 20 | 20 | 1 | 31037. 97 | 3220. 933 | 3221. 135 | -2 | +0. 005 | OH—Ti I | B |
| | | | | | | | 21 | 31036. 09 | 3221. 130 | | | | | |
| | | | | | | | 2 | 31033. 49 | 3221. 398 | | | | | |
| | | | | | | | 3 | 31028. 02 | 3221. 966 | | | | | |
| | | | | | | | 7 | 31027. 31 | 3222. 040 | | | | | |
| | 5, 5' | 11 | 6 | 11' | 20 | 20 | 2 | 31103. 28 | 3224. 537 | 3224. 925 | 0 | +0. 044 | Fe I | M |
| | | | | | | | 1 | 31002. 17 | 3224. 653 | | | | | |
| | | | | | | | 20 | 30999. 98 | 3224. 881 | | | | | |
| | | | | | | | 21 | 30997. 79 | 3225. 093 | | | | | |
| | | | | | | | 14 | 30997. 24 | 3225. 166 | | | | | |
| | 7 | 12 | 7 | 11 | 20 | 20 | 1 | 30995. 51 | 3225. 346 | 3226. 446 | -1 | +0. 003 | OH | M |
| | | | | | | | 2 | 30984. 97* | 3226. 443 | | | | | |
| | | | | | | | 19 | 30973. 74 | 3227. 613 | | | | | |
| | | | | | | | 19 | 30959. 61 | 3228. 086 | | | | | |
| | | | | | | | 19 | 30950. 83 | 3229. 990 | | | | | |
| | 4 | 6 | 6' | 13 | 12 | 12 | 14 | 30939. 35 | 3231. 201 | 3231. 222 | -3 | +0. 021 | OH?—Ce II | B |
| | | | | | | | 3 | 30937. 73 | 3231. 370 | | | | | |
| | | | | | | | 18 | 30936. 75* | 3231. 473 | | | | | |
| | | | | | | | 17 | 30914. 94 | 3233. 752 | | | | | |
| | | | | | | | 17 | 30899. 79 | 3235. 338 | | | | | |
| | 8 | 7 | 7' | 13 | 13 | 13 | 14 | 30885. 95 | 3236. 787 | 3236. 923 | -2 | -0. 003 | OH | P |
| | | | | | | | 11 | 30884. 62 | 3236. 926 | | | | | |
| | | | | | | | 14 | 30878. 47 | 3237. 571 | | | | | |
| | | | | | | | 16 | 30865. 95 | 3238. 885 | | | | | |
| | | | | | | | 1+3 | 30863. 24* | 3239. 170 | | | | | |
| | 5 | 8' | 8 | 14 | 14 | 14 | 15 | 30844. 71 | 3241. 115 | 3241. 138 | -3 | +0. 023 | OH?—Sm II | B |
| | | | | | | | 2 | 30830. 03 | 3242. 658 | | | | | |
| | | | | | | | 12 | 30828. 51 | 3242. 819 | | | | | |
| | | | | | | | 14 | 30814. 55 | 3244. 287 | | | | | |
| | | | | | | | 14 | 30812. 58 | 3244. 495 | | | | | |
| | 6 | 9' | 9 | 15 | 15 | 15 | 1+13 | 30785. 44 | 3247. 355 | 3250. 637 | 3N | +0. 037 | Fe I | A |
| | | | | | | | 2 | 30770. 13 | 3248. 971 | | | | | |
| | | | | | | | 12 | 30768. 41 | 3249. 153 | | | | | |
| | | | | | | | 12+9 | 30754. 71* | 3250. 600 | | | | | |
| | | | | | | | 13 | 30747. 49 | 3251. 364 | | | | | |
| | 10 | 15 | 15 | 15 | 15 | 15 | 12+9 | 30754. 71* | 3251. 353 | 3250. 637 | 1N | -0. 011 | Fe IIp Se II? | M |
| | | | | | | | 13 | 30747. 49 | 3251. 353 | | | | | |

| | | | | | | | | | | |
|----|-----|----|--|-------|------------|-----------|-----|---------|-------|---|
| 7 | 10' | 16 | | 11 | 30721. 82 | 3254. 080 | 1N | -0. 020 | Mn I | M |
| | | | | 1 | 30706. 41 | 3255. 713 | | | | |
| 11 | 11' | 16 | | 12+1 | 30704. 48* | 3255. 918 | 6 | -0. 017 | Fe II | M |
| | | | | 1+1 | 30703. 60* | 3256. 010 | | | | |
| 11 | 11' | 17 | | 10+1 | 30692. 47* | 3257. 192 | | | | A |
| | | | | 13 | 30677. 20 | 3258. 814 | | | | |
| 12 | 12' | 17 | | 9+2+2 | 30653. 79* | 3261. 302 | 3 | -0. 031 | Fe II | M |
| | | | | 1+2 | 30638. 59* | 3262. 920 | | | | A |
| 12 | 12' | 18 | | 11 | 30636. 79 | 3263. 112 | -3 | +0. 021 | OH | P |
| | | | | 9 | 30625. 62 | 3264. 302 | | | | |
| 13 | 13 | 18 | | 12+1 | 30603. 61* | 3266. 650 | 3N | +0. 026 | Cr I— | M |
| | | | | 8 | 30581. 21 | 3269. 043 | | | | |
| 14 | 14 | 19 | | 1+1 | 30567. 65* | 3270. 493 | -3N | +0. 011 | OH | P |
| | | | | 10 | 30565. 36 | 3270. 738 | | | | |
| 15 | 15 | 19 | | 8 | 30553. 98 | 3271. 956 | | | | |
| | | | | 10+1 | 30526. 69* | 3274. 881 | | | | |
| 16 | 16 | 20 | | 7+17 | 30503. 90* | 3277. 328 | 1 | +0. 028 | Ni II | M |
| | | | | 9 | 30490. 25 | 3278. 795 | | | | |
| 17 | 17 | 20 | | 7 | 30477. 58 | 3280. 158 | | | | |
| | | | | 9 | 30446. 32 | 3283. 526 | | | | |
| 18 | 18 | 21 | | 6 | 30421. 81 | 3286. 172 | | | | |
| | | | | 8 | 30411. 45 | 3287. 291 | | | | |
| 19 | 19 | 21 | | 6 | 30396. 26 | 3288. 934 | | | | |
| | | | | 8 | 30362. 54 | 3292. 587 | | | | |
| 20 | 20 | 22 | | 5 | 30334. 62 | 3295. 617 | | | | |
| | | | | 7 | 30328. 91 | 3296. 238 | | | | |
| 21 | 21 | 22 | | 5 | 30309. 73 | 3298. 325 | | | | |
| | | | | 7 | 30275. 12 | 3302. 095 | | | | |
| 22 | 22 | 22 | | 6+4 | 30242. 63 | 3305. 643 | -2N | -0. 016 | Fe II | M |
| | | | | 4 | 30217. 95 | 3308. 342 | | | | |
| 23 | 23 | 23 | | 6 | 30184. 11 | 3312. 051 | | | | |
| | | | | 5 | 30152. 65 | 3315. 507 | | | | |
| 24 | 24 | 23 | | 3 | 30144. 34 | 3316. 421 | | | | |
| | | | | 3+3 | 30120. 44* | 3319. 053 | | | | |
| 25 | 25 | 23 | | 5 | 30089. 32 | 3322. 485 | | | | |
| | | | | 4+3 | 30058. 68* | 3325. 873 | | | | |
| 26 | 26 | 23 | | 4 | 29990. 76 | 3333. 405 | | | | |
| | | | | 4 | 29960. 78 | 3336. 741 | | | | |
| 27 | 27 | 23 | | 3 | 29888. 18 | 3344. 846 | | | | |
| | | | | 3 | 29858. 81 | 3348. 136 | | | | |
| 28 | 28 | 23 | | 3 | 29781. 53 | 3356. 825 | | | | |
| | | | | 2 | 29752. 48 | 3360. 072 | | | | |
| 29 | 29 | 23 | | 2 | 29670. 76 | 3369. 367 | | | | |
| | | | | 2 | 29642. 30 | 3372. 592 | | | | |

*Blend.

WASHINGTON, D.C.

(Paper 63A3-23).